6. QUALITY ASSURANCE
CONDUCT OF OPERATIONS,
CONFIGURATION MANAGEMENT AND TRAINING

A. QUALITY ASSURANCE

1. General

It is the objective of the RHIC Project to construct a safe, highly reliable collider that is routinely available for nuclear physics research. To accomplish this task, comprehensive quality, reliability and maintainability concepts will be integrated into the design, production and usage phases of the RHIC Project. This will be accomplished through the implementation of a formal Project Quality Assurance Program (QAP) which was prepared by BNL, reviewed by the DOE, Chicago Field Office and approved by the DOE Project Manager January 7, 1991. It complied with the 18 basic requirements of the American National Standard ANSI/ASME NQA-1-1989 edition, pages 2 - 4. The RHIC QAP was subsequently revised to comply with a new DOE Order 5700.6C and its guideline. RHIC QAP, Revision C, was approved by the Program Secretarial Officer (PSO) in September 1992. The RHIC QAP was the first Major System Acquisition (MSA) QAP to receive PSO approval, as required by the subject Order. The program describes how the prevention, assessment and correction functions of QA will be planned and integrated into all RHIC Project activities in a timely and cost effective manner in accordance with DOE Order 4700.1, as applicable. Procedures and instructions necessary to implement the QA Program are included in the RHIC Project Quality Assurance Manual which is complete.

2. Responsibility

Responsibility for RHIC quality starts with the Project Director, who reports directly to the BNL Director, and permeates down through the entire project organization. Each Division Head, Section Head, Manager and Supervisor and each Experimental Project Director and associated experimental project staff within the Project is responsible and accountable for the quality of his/her work and that of his/her subordinates. Everyone, including individual contributors, assumes their appropriate share of quality responsibility.

An Assistant to the Project Director for Quality Assurance (APDQA) has been appointed by the RHIC Project Director to coordinate and assist in the development and implementation of the RHIC QA Program. The APDQA and his staff provide direction, guidance and support to the technical divisions. The BNL QA Director's office provides guidance, assistance and direction to the Project and audit compliance to its program and procedures.

Designated Quality Assurance Representatives (QRs) have been appointed by the Division/Section Heads and Experimental Project Directors to act on their behalf. They are competent individuals who are trained in QA principles, respected by their peers and concerned about the successful implementation of the RHIC Quality Program. QRs report directly to their Division/Section Heads or Experimental Project Director on matters pertaining to quality. Implementation of the QA Program is the responsibility of every individual. However, QRs serve as focal points and catalysts within their RHIC Divisions and Sections or experimental project to ensure the proper and timely fulfillment of QA functions. QRs inform the APDQA of activities, problems, status and meet periodically to discuss the RHIC Quality Program.

3. Activities

The Project staff plans, develops, defines and controls the design of RHIC and its components in a manner that assures the consistent achievement of the producibility, performance, safety, reliability, maintainability and availability objectives. A graded approach to QA has been employed to place the most emphasis upon and allocate proper resources to those items that could have the greatest effect upon personnel and environmental safety, Collider performance, cost and schedule.

QA activities are governed by appropriate procedures and instructions that have been prepared and approved by the RHIC Project Management. These documents, which are included in the RHIC QA Manual, provide a consistent method for satisfying the elements of the QA program. Quality-related documents are uniquely identified, reviewed and approved by the appropriate QA authority, and the revision status is denoted on the documents. The initial release, distribution and control of documents and changes thereto are the responsibility of designated individuals or groups within the Project, depending upon the type of document, to ensure the correct documents are used.

For baselined documents, a RHIC Central Document Storage System (CDSS) was established in 1994. The CDSS is the repository for the computer generated files of baselined engineering drawings and specifications.

Personnel responsible for the design or performance of items or services to be purchased, with the assistance of the RHIC QA staff, ensure that the procurement requirements of the purchase requests are clear and complete. Procurement requirements may include source evaluation and selection, evaluation of objective evidence of quality furnished by suppliers, source inspection and audits. RHIC Project Divisions/Sections ensure that the suppliers who are selected to provide them with goods or services are capable of meeting the technical and quality requirements of the procurement, and that the goods or services provided by the suppliers are acceptable for intended use. Inspection and/or test of items received for the RHIC Project are performed, in accordance with the specific written instructions of the cognizant engineer or scientist, at a location specified by that person.

The Project QA office participates in the review of purchase documentation for major procurements; participates on the Source Evaluation Boards; and the APDQA, or his designee, is the QA interface referenced in the major contracts. BNL QA oversight and audits on major suppliers is performed by Project QA and/or QRs. Project QA is similarly involved in Detector procurements.

The RHIC Project Management has established and uses procedures that ensure that only acceptable items are used. Identification is maintained on the items or in documents traceable to the items, or in a manner which assures that identification is established and maintained. Nonconforming items are clearly identified as such. Items having limited calendar or operating life are identified and controlled in a manner that will preclude their use after the expiration of the calendar or operating life.

Special processes, where quality cannot be readily controlled or determined by inspection and test alone, or unique critical or major processes are controlled by written procedures. The procedures, personnel or equipment necessary for the performance or verification of the process must be qualified, in accordance with specified requirements determined by the cognizant engineer or scientist.

Inspections and tests are performed to provide a means of determining the acceptability of an item for its intended use. Inspections and tests are performed by qualified personnel, in accordance with instructions or procedures describing the effort to be performed and the criteria for acceptance. When required, the results of the inspections and tests are recorded and an indication of acceptability or unacceptability is traceable to the item or lot being inspected or tested.

The calibration requirements, frequency of calibration and recall system for each item of equipment is established on the basis of purpose, accuracy required, stability and amount of usage. The calibration requirements for each item of equipment is based upon its most stringent application not to exceed manufacturer's specification, and is revised when its purpose, stability, or usage change. Any equipment found out of calibration is not used.

Special requirements for handling, cleaning, storing, packaging, preserving and shipping are specified by the cognizant engineer or scientist on drawings, specifications, instructions and work-authorizing documents. Only items that are acceptable for use are permitted into the flow of work during manufacturing, construction, installation, inspection operations, repair and maintenance activities. Nonconforming items are identified as such and are not permitted to enter or remain in the work flow, unless a technical decision by authorized personnel determines that they are temporarily or permanently acceptable for use. Action is taken, as appropriate, to determine the cause of critical, recurring, trend or pattern nonconformances and to develop and implement a remedy that will preclude the recurrence of such nonconformances. Corrective action may be taken with respect to operations within design, procurement, manufacturing, or other activities which have resulted in, or may result in nonconformances. Follow up action shall be taken to verify implementation of corrective action taken.

Sufficient records are required and maintained to furnish objective evidence of actions affecting quality. Quality Assurance records are traceable to the phase of the activity when they were recorded and to the item, process or operation to which they apply. Records shall be legible and retrievable and shall be protected from damage and deterioration.

The adequacy and effectiveness of the QA program is verified by planned audits. Audits are performed by qualified personnel who do not have direct responsibility in the areas being verified, as

stated in the approved Quality Assurance Program. Audit results are documented and distributed to RHIC Project Management. RHIC Project Management, in fulfilling its responsibility, periodically evaluates the effectiveness of the QA program. This is done through reviews, assessments and/or other formal means. RHIC Project Management shall take whatever action is necessary to guarantee the implementation of this QA program and to initiate any actions that may be needed to correct situations or conditions that could adversely affect the quality of the Collider.

Independent assessment of the RHIC QA program, as required by DOE Order 5700.6C, is carried out by DOE CH and BHO staff periodically.

B. CONDUCT OF OPERATIONS

The RHIC Project will in part ensure quality, uniformity and documentation of operation via the Conduct of Operations. The RHIC Operations Procedures Manual (OPM), although not a safety manual, is the mechanism to implement many of the safety and non-safety related requirements of the accelerator complex.

The OPM has been applied to the following aspects of Project construction activities:

a. Cryogenic compressors and refrigerators.

b. Designated magnet fabrication tooling, excluding standard machine tools.

c. Any system with significant programmatic impact(s).

d. Processes that contain significant ES&H hazards.

e. Personnel safety interlocks.

f. Quality Assurance level-1 personnel protection systems.

g. Environmental protection systems and procedures.

Commissioning of the Transfer Line and the Sextant Test utilize the AGS Conduct of Operations and are supervised by the RHIC and AGS management, as appropriate.

Operation of the Collider in routine operation requires that a Conduct of Operations Matrix be completed prior to Operational Readiness approval.

C. CONFIGURATION MANAGEMENT PLAN

Configuration Management (CM) is the system by which technical baselines are determined and changes to those baselines are controlled, documented and verified. Three primary activities

implement the configuration management system: configuration identification, configuration control, configuration status accounting. The RHIC Configuration Management Plan defines the management system for facilities and equipment with the RHIC Complex. it outlines the roles and responsibilities of personnel involved in the configuration management process and the procedures to implement changes. The plan is designed to comply with the configuration management requirements outlined in Department of Energy (DOE) Order 4700.1 and 4700.4, as applicable.

Since the PASS System must comply with QA-1 requirements, additional configuration controls have been imposed by RHIC OPM 4.91, "Configuration Management Control and Review of Engineering Changes to the Particle Accelerator Safety System."

Supplemental configuration controls exist for the removal and restoration of shielding. These controls are stated in AGS OPM 8.13, "Procedure for Shielding Barrier Removal, Removal of Primary Area Beam Line Components, or Modifications."

At the time of commissioning, initial configurations shall be verified by the Accelerator Readiness Review.

D. TRAINING

The policy for the Conduct of Training has been issued in RHIC OPM 5.7.0.0, so as to ensure facility specific safety training of any BNL employee, visitor or experimenter who will require unescorted entry into one or more of the buildings which form the RHIC facility.

The RHIC Project will ensure the training of individuals including: employees, contractor employees, experimenters, guests, visitors and all others who perform work within the RHIC facility. Training shall be provided to the level appropriate to ensure conformance to the RHIC OPM to protect the environment and to maintain the health and safety of personnel at the RHIC facility.